

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A data processing device comprising:
an improvement information generating means for generating unit adapted to generate
improvement information for improving quality of data; and
an embedding means for embedding unit adapted to embed the a plurality of types of
improvement information into the data, wherein the improvement information generating unit
generates the plurality of types of improvement information for converting the data into a
plurality of qualities.
2. (Currently Amended) The data processing device as claimed in claim 1, wherein the
improvement information generating means unit generates a prediction coefficient used for
predicting a prediction value of quality-improved data obtained by improving the quality of the
data, as the improvement information.
3. (Currently Amended) The data processing device as claimed in claim 2, wherein the
improvement information generating means unit generates the prediction coefficient for each
predetermined class.

4. (Currently Amended) The data processing device as claimed in claim 3, wherein the improvement information generating means-unit comprises:

a class tap constructing ~~means for constructing-unit adapted to construct~~ a class tap used for finding a class of target teacher data of teacher data to be a teacher, by using learner data to be a learner;

a classifying ~~means for carrying-unit adapted to carry~~ out classification for finding the class among the target teacher data on a basis of the class tap;

a prediction tap constructing ~~means for constructing-unit adapted to construct~~ a prediction tap used together with the prediction coefficient for predicting the target teacher data, by using the learner data; and

a prediction coefficient operation ~~means for finding-unit adapted to find~~ the prediction coefficient for each class by using the teacher data and the prediction tap.

5. (Currently Amended) The data processing device as claimed in claim 4, wherein the improvement information generating means-unit generates a plurality of types of improvement information.

6. (Currently Amended) The data processing device as claimed in claim 5, wherein the improvement information generating means-unit generates prediction coefficients for different number of classes as the plurality of types of improvement information.

7. (Currently Amended) The data processing device as claimed in claim 5, wherein the improvement information generating means-unit generates a plurality of types of prediction

coefficients found by using learner data or teacher data of different qualities, as the plurality of types of improvement information.

8. (Currently Amended) The data processing device as claimed in claim 5, wherein the improvement information generating ~~means-unit~~ generates at least the prediction coefficient and information for carrying out linear interpolation, as the plurality of types of improvement information.

9. (Currently Amended) The data processing device as claimed in claim 5, wherein the improvement information generating ~~means-unit~~ generates a plurality of types of prediction coefficients found by using class taps or prediction taps of different structures, as the plurality of types of improvement information.

10. (Currently Amended) The data processing device as claimed in claim 5, wherein the improvement information generating ~~means-unit~~ generates a plurality of types of prediction coefficients found by carrying out classification by different methods, as the plurality of types of improvement information.

11. (Currently Amended) The data processing device as claimed in claim 1, wherein the improvement information generating ~~means-unit~~ generates, as the improvement information, a class code expressing the class of the data, used for predicting the prediction value of the quality-improved data obtained by improving the quality of the data.

12. (Currently Amended) The data processing device as claimed in claim 11, wherein the improvement information generating means-unit comprises:

a prediction tap constructing means-for-constructing-unit adapted to construct a prediction tap used for predicting target teacher data of teacher data to be a teacher, by using learner data to be a learner;

a prediction coefficient storage means-for-storing-unit adapted to store a prediction coefficient for each class code found by learning;

a predictive operation means-for-finding-unit adapted to find a prediction value of the target teacher data by using the prediction tap and the prediction coefficient; and

a class code detecting means-for-detecting-unit adapted to detect the class code of a prediction coefficient that minimizes the prediction value of the target teacher data; and

wherein the improvement information generating means-unit outputs the class code detected by the class code detecting means-unit, as the improvement information.

13. (Currently Amended) The data processing device as claimed in claim 11, wherein the improvement information generating means-unit comprises:

a class tap constructing means-for-generating-unit adapted to generate a class tap used for finding the class of target teacher data of teacher data to be a teacher, by using the teacher data; and

a classifying means-for-carrying-unit adapted to carry out classification for finding the class of the target teacher data on the basis of the class tap; and

wherein the improvement information generating ~~means-unit~~ outputs a class code corresponding to the class found by the ~~classification-means~~ classifying unit, as the improvement information.

14. (Currently Amended) The data processing device as claimed in claim 1, wherein the embedding ~~means-unit~~ embeds the improvement information into the data so that the data and the improvement information can be restored, by using a bias of energy held by the data.

15. (Currently Amended) The data processing device as claimed in claim 1, wherein the embedding ~~means-unit~~ embeds the improvement information into the data by carrying out spectrum spreading.

16. (Currently Amended) The data processing device as claimed in claim 1, wherein the embedding ~~means-unit~~ embeds the improvement information into the data by changing one or more bits of the data to the improvement information.

17. (Original) The data processing device as claimed in claim 1, wherein the data is image data and the improvement information is information for improving image quality of the image data.

18. (Currently Amended) A data processing method comprising:
an improvement information generating step of generating improvement information for improving quality of data; and

an embedding step of embedding ~~the~~ a plurality of types of improvement information into the data, wherein the improvement information generating step generates the plurality of types of improvement information for converting the data into a plurality of qualities.

19. (Currently Amended) A recording medium having recorded thereon a program to be executed by a computer, the program comprising:

an improvement information generating step of generating improvement information for improving quality of data; and

an embedding step of embedding ~~the~~ a plurality of types of improvement information into the data, wherein the improvement information generating step generates the plurality of types of improvement information for converting the data into a plurality of qualities.

20. (Cancelled)

21. (Currently Amended) A data processing device for processing embedded data obtained by embedding a plurality of types of improvement information for improving quality of data into the data, the device comprising:

~~an extracting means for extracting unit adapted to extract the~~ a plurality of types of improvement information from the embedded data; and

~~an improving means for improving unit adapted to improve~~ the quality of the data by using ~~the one of the~~ a plurality of types of improvement information according to a user request.

22. (Currently Amended) The data processing device as claimed in claim 21, wherein the improvement information is a prediction coefficient used for predicting a prediction value of quality-improved data obtained by improving the quality of the data, and the improving means unit finds the prediction value of the quality-improved data by using the data and the prediction coefficient.

23. (Currently Amended) The data processing device as claimed in claim 22, wherein the improvement information is a prediction coefficient found for each predetermined class, and the improving means-unit finds the prediction value of the quality-improved data by using the data and the prediction coefficient for each class.

24. (Currently Amended) The data processing device as claimed in claim 23, wherein the improving means-unit comprises:

a class tap constructing means-for constructing-unit adapted to construct a class tap used for finding a class of target quality-improved data, which is targeted quality-improved data, by using the data;

a classifying means-for carrying-unit adapted to carry out classification for finding the class of the target quality-improved data on the basis of the class tap;

a prediction tap constructing means-for constructing-unit adapted to construct a prediction tap used together with a prediction coefficient for predicting the target quality-improved data, by using the data; and

a predicting means for finding unit adapted to find a prediction value of the target quality-improved data by using the prediction coefficient of the class of the target quality-improved data and the prediction tap.

25. (Currently Amended) The data processing device as claimed in claim 21, wherein the improvement information is a class code expressing the class of a prediction coefficient for each predetermined class used for predicting a prediction value of quality-improved data obtained by improving the quality of data, and the improving means unit finds the prediction value of the quality-improved data by using the data and the prediction coefficient corresponding to the class code.

26. (Currently Amended) The data processing device as claimed in claim 25, wherein the improving means unit comprises:

a prediction tap constructing means for constructing unit adapted to construct a prediction tap used together with a prediction coefficient for predicting target quality-improved data, which is targeted quality-improved data, by using the data; and

a predicting means for finding unit adapted to predict a prediction value of the target quality-improved data by using the prediction coefficient corresponding to the class code as the improvement information and the prediction tap.

27. (Original) The data processing device as claimed in claim 24, wherein a plurality of types of improvement information are embedded in the embedded data.

28. (Original) The data processing device as claimed in claim 27, wherein the prediction coefficients for different numbers of classes are embedded in the embedded data as the plurality of types of improvement information.
29. (Original) The data processing device as claimed in claim 27, wherein the prediction coefficient is generated by using learner data to be a learner and teacher data to be a teacher, and a plurality of types of prediction coefficients found by using learner data or teacher data of different qualities are embedded in the embedded data as the plurality of types of improvement information.
30. (Original) The data processing device as claimed in claim 27, wherein at least the prediction coefficient and information for carrying out linear interpolation are embedded in the embedded data as the plurality of types of improvement information.
31. (Original) The data processing device as claimed in claim 27, wherein a plurality of types of prediction coefficients found by using class taps or prediction taps of different structures are embedded in the embedded data as the plurality of types of improvement information.
32. (Original) The data processing device as claimed in claim 27, wherein a plurality of types of prediction coefficients found by carrying out classification by different methods are embedded in the embedded data as the plurality of types of improvement information.

33. (Currently Amended) The data processing device as claimed in claim 27, further comprising an improvement information selecting means ~~for selecting unit~~ adapted to select improvement information used for improving the quality of the data, from the plurality of types of improvement information.

34. (Currently Amended) The data processing device as claimed in claim 21, wherein the extracting means-unit extracts the improvement information from the embedded data by using the bias of energy held by the data.

35. (Currently Amended) The data processing device as claimed in claim 21, wherein the extracting means-unit extracts the improvement information from the embedded data by carrying out inverse spectrum spreading.

36. (Currently Amended) The data processing device as claimed in claim 21, wherein the extracting means-unit extracts one or more bits of the embedded data as the improvement information.

37. (Original) The data processing device as claimed in claim 21, wherein the data is image data and the improvement information is information for improving the image quality of the image data.

38. (Currently Amended) A data processing method for processing embedded data obtained by embedding a plurality of types of improvement information for improving quality of data into the data, the method comprising:

an extracting step of extracting the plurality of types of improvement information from the embedded data; and

an improving step of improving the quality of the data by using one of the plurality of types of improvement information according to a user request.

39. (Currently Amended) A recording medium having recorded thereon a program to be executed by a computer for processing embedded data obtained by embedding a plurality of types of improvement information for improving the quality of data into the data, the program comprising:

an extracting step of extracting the plurality of types of improvement information from the embedded data; and

an improving step of improving the quality of the data by using one of the plurality of types of improvement information according to a user request.

40. (Cancelled)

41. (Currently Amended) A data processing device comprising:

an improvement information generating means for generating unit adapted to generate a plurality of types of improvement information for improving quality of data; and

an improvement information selecting unit adapted to select improvement information to be transmitted together with the data, from the plurality of types of improvement information;
and;

a transmitting means for transmitting unit adapted to transmit the data and one or more types of the plurality of types of improvement information.

42. (Currently Amended) The data processing device as claimed in claim 41, further comprising improvement information selecting means-unit for selecting improvement information to be transmitted together with the data, from the plurality of types of improvement information.

43. (Currently Amended) The data processing device as claimed in claim 42, wherein the improvement information selecting means-unit selects the improvement information in response to a request from a receiving device which receives the data.

44. (Currently Amended) The data processing device as claimed in claim 43, further comprising an accounting means for carrying unit adapted to carry out accounting in correspondence with the improvement information selected by the improvement information selecting means unit.

45. (Currently Amended) The data processing device as claimed in claim 41, wherein the improvement information generating means-unit generates at least a prediction coefficient used

for predicting a prediction value of quality-improved data obtained by improving the quality of the data, as the improvement information.

46. (Currently Amended) The data processing device as claimed in claim 45, wherein the improvement information generating ~~means-unit~~ generates a prediction coefficient for each predetermined class.

47. (Currently Amended) The data processing device as claimed in claim 46, wherein the improvement information generating ~~means-unit~~ comprises:

a class tap constructing means-for-constructing-unit adapted to construct a class tap used for finding the class of target teacher data of teacher data to be a teacher, by using learner data to be a learner;

a classifying means-for-carrying-unit adapted to carry out classification for finding the class of the target teacher data on the basis of the class tap;

a prediction tap constructing means-for-constructing-unit adapted to construct a prediction tap used together with a prediction coefficient for predicting the target teacher data, by using the learner data; and

a prediction coefficient operation means-for-finding-unit adapted to find a prediction coefficient for each class by using the teacher data and the prediction tap.

48. (Currently Amended) The data processing device as claimed in claim 47, wherein the improvement information generating ~~means-unit~~ generates prediction coefficients for different numbers of classes as the plurality of types of improvement information.

49. (Currently Amended) The data processing device as claimed in claim 47, wherein the improvement information generating ~~means-unit~~ generates a plurality of types of prediction coefficients found by using learner data or teacher data of different qualities, as the plurality of types of improvement information.

50. (Currently Amended) The data processing device as claimed in claim 47, wherein the improvement information generating ~~means-unit~~ generates at least the prediction coefficient and information for carrying out linear interpolation, as the plurality of types of improvement information.

51. (Currently Amended) The data processing device as claimed in claim 47, wherein the improvement information generating ~~means-unit~~ generates a plurality of types of prediction coefficients found by using class taps or prediction taps of different structures, as the plurality of types of improvement information.

52. (Currently Amended) The data processing device as claimed in claim 47, wherein the improvement information generating ~~means-unit~~ generates a plurality of types of prediction coefficients found by carrying out classification by different methods, as the plurality of types of improvement information.

53. (Currently Amended) The data processing device as claimed in claim 41, wherein the transmitting ~~means-unit~~ embeds the improvement information into the data so that the data and

the improvement information can be restored, by using the bias of energy held by the data, and transmits the data and one or more types of improvement information.

54. (Currently Amended) The data processing device as claimed in claim 41, wherein the transmitting ~~means-unit~~ embeds the improvement information into the data by carrying out spectrum spreading and transmits the data and one or more types of improvement information.

55. (Currently Amended) The data processing device as claimed in claim 41, wherein the transmitting ~~means-unit~~ embeds the improvement information into the data by changing one or more bits of the data to the improvement information and transmits the data and one or more types of improvement information.

56. (Currently Amended) The data processing device as claimed in claim 41, wherein the transmitting ~~means-unit~~ transmits the data and all the plurality of types of improvement information.

57. (Original) The data processing device as claimed in claim 41, wherein the data is image data and the improvement information is information for improving the image quality of the image data.

58. (Currently Amended) A data processing method comprising:
an improvement information generating step of generating a plurality of types of improvement information for improving quality of data; and

an improvement information selecting unit adapted to select improvement information to be transmitted together with the data, from the plurality of types of improvement information; and;

a transmitting step of transmitting the data and one ~~or more types of~~ the plurality of types of improvement information.

59. (Currently Amended) A recording medium having recorded thereon a program to be executed by a computer, the program comprising:

an improvement information generating step of generating a plurality of types of improvement information for improving the quality of data; and

an improvement information selecting unit adapted to select improvement information to be transmitted together with the data, from the plurality of types of improvement information; and;

a transmitting step of transmitting the data and one ~~or more types of~~ the plurality of types of improvement information.

60. (Cancelled)

61. (New) A data processing device comprising:

an improvement information generating unit adapted to generate improvement information for improving quality of data; and

an embedding unit adapted to embed improvement information into the data, wherein the embedding unit embeds the improvement information into the data so that the data and the improvement information can be restored, by using a bias of energy held by the data.

62. (New) A data processing device for processing embedded data obtained by embedding improvement information for improving quality of data into the data, the device comprising:

an extracting unit adapted to extract the improvement information from the embedded data; and

an improving unit adapted to improve the quality of the data by using the improvement information, wherein the extracting unit extracts the improvement information from the embedded data by using the bias of energy held by the data.

63. (New) A data processing device comprising:

an improvement information generating unit adapted to generate a plurality of types of improvement information for improving quality of data;

an improvement information selecting unit for selecting improvement information to be transmitted together with the data, from the plurality of types of improvement information; and

a transmitting unit adapted to transmit the data and one or more types of improvement information, wherein the improvement information selecting unit selects the improvement information in response to a request from a receiving device which receives the data.

64. (New) A data processing device comprising:

an improvement information generating unit adapted to generate a plurality of types of improvement information for improving quality of data;

an improvement information selecting unit for selecting improvement information to be transmitted together with the data, from the plurality of types of improvement information;

a transmitting unit adapted to transmit the data and one or more types of improvement information; and

an accounting unit adapted to carry out accounting in correspondence with the improvement information selected by the improvement information selecting unit, wherein the improvement information selecting unit selects the improvement information in response to a request from a receiving device which receives the data.

65. (New) A data processing device comprising:

an improvement information generating unit adapted to generate a plurality of types of improvement information for improving quality of data; and

a transmitting unit adapted to transmit the data and one or more types of improvement information, wherein the transmitting unit embeds the improvement information into the data so that the data and the improvement information can be restored, by using the bias of energy held by the data, and transmits the data and one or more types of improvement information.